

Appendix E

Evaluation of Geophysical Survey Data and Disposal Information to Support Selection of Type B Probe locations around Buried Stainless Steel at Soil Vault Row-12

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Evaluation of Geophysical Survey Data and Disposal Information to Support Selection of Type B Probe Locations around Buried Stainless Steel at Soil Vault Row 12

Soil Vault Row 12 Type B Probe Placement

Nicholas E. Josten and Hopi Salomon

Irradiated stainless steel reactor components have the potential to disperse C-14 through corrosion processes and are the target for Type B probes in the vicinity of Soil Vault Row (SVR) -12. For this purpose, Type B probes are preferably installed in the immediate vicinity of a soil vault containing reactor components. Additional probes (vapor ports) are placed at progressively greater distances from the soil vault in order to evaluate contaminant mobility in the gas phase.

Historical records indicate 15 disposals were made at 10 separate locations along the east end of SVR-12. Seven of the disposal locations are thought to contain only irradiated stainless steel pieces (listed as originating from Generator Area CPP-603 in Table D-1). Records provide an approximate location for each disposal location relative to the east end row marker of SVR-12. Due to the approximate nature of the recorded positions and uncertainty regarding the east end marker location at the time of disposal, geophysical data were analyzed to support selection of a specific location to install Type B probes.

Table E-1. Disposal Information for east end of SVR-12.

Generator Area	Location ^a	Disposal date	Volume (m ³)	Weight (grams)
CPP-603	SVR12 + 10 ft	05-May-82	0.8213	544300
CPP-603	SVR12 + 10 ft	20-May-82	0.8213	544300
CPP-603	SVR12 + 20 ft	02-Jun-82	0.8213	544300
TRA647	SVR12 + 20 ft	04-Jun-82	0.8496	317500
TRA647	SVR12 + 33 ft	07-Jun-82	0.8496	317500
TRA647	SVR12 + 33 ft	08-Jun-82	0.8496	317500
TRA647	SVR12 + 44 ft	08-Jun-82	0.8496	317500
TRA647	SVR12 + 44 ft	09-Jun-82	0.8496	317500
CPP-603	SVR12 + 55 ft	21-Jun-82	0.8213	544300
CPP-603	SVR12 + 55 ft	30-Jun-82	0.8213	544300
CPP-603	SVR12 + 65 ft	30-Jun-82	0.8213	544300
CPP-603	SVR12 + 75 ft	08-Jul-82	0.8213	544300
CPP-603	SVR12 + 85 ft	13-Jul-82	0.8213	544300
CPP-603	SVR12 + 122 ft	21-Jul-82	0.8213	544300
CPP-603	SVR12 + 132 ft	28-Jul-82	0.8213	544300

a. Distance from east end of SVR-12

Figures E-1 and E-2 show high resolution magnetic and electromagnetic (EM) induction data for the area surrounding SVR-12. Highlights show anomalies that indicate the presence of buried metal objects along the trend of SVR-12. Figures E-1 and E-2 also show the recorded positions of the Table E-1 inventory items relative the current east end marker (this metal marker is visible as a clear geophysical anomaly in both the magnetic and EM data). The number and spacing of the combined magnetic and EM geophysical anomalies roughly correspond with the number and spacing of recorded disposals.^m In this analysis, the geophysical anomalies are interpreted to reflect the actual position of the disposals.

Figure E-3 shows a possible association between inventory items and geophysical anomalies. This interpretation is based on the assumption that the current east end marker has not moved since the waste was buried and recorded in 1982. In making this association, anomalies occurring well off the SVR-12 trend were attributed to Trench 41, with the exception of the anomaly labeled +10. Of particular interest are the group of waste recorded as disposed from +55 to + 85 ft, which are associated with a cluster of magnetic and EM anomalies occurring over a 40 ft interval. The +65 disposal was selected as a preferred target because it has both a magnetic and EM signature and because it falls near the middle of the interval of interest. Although the correlation between inventory and geophysics for this disposal group is imperfect, any one of the disposals within this interval constitutes an acceptable target for Type B probes. Even if the association of inventory and geophysics is off by 10 – 15 ft, the selected geophysical anomaly would most likely still be associated with an irradiated stainless steel item shipped from CPP-603.

Figure E-4 shows a detail of the selected target and the proposed Type B probe locations. The radially arranged vapor port probe locations are set at 4.0 ft, 8.6 ft., and 13.2 ft from the center of the targeted soil vault. The closest probes (the first bundle of vapor ports and the lysimeter bundle) are positioned to lie 2 ft outside the edge of a 2 ft radius object representing the assumed waste disposal. The next two radially arranged vapor port probes are at 140 cm (4.6 ft) and 2.80 m (9.2 ft) from first probe. This is similar to the approach proposed to monitor activated beryllium at SVR-20. The line of vapor port probes was chosen to lie as close to perpendicular to SVR-12 as possible but was skewed to avoid any contact with metallic waste in adjacent trenches. The tripled vapor port bundles should be placed such that the deepest is at refusal, the middle is completed approximately 3 ft closer to the surface and the upper is completed approximately 6 ft above refusal. This should insure that the targeted waste has the most complete sampling coverage possible. The lysimeter bundle, like the closest vapor ports are also arranged as close as possible to the targeted waste. The deep lysimeter should be completed at refusal. The upper lysimeter should be completed approximately 3 ft above refusal. Remaining probes, i.e. tensiometers, moisture and geochemical probes, are arranged with less specificity, but still relatively close to the source, with vertical completion determined in the field.

The proposed probe bundle coordinates are given in Table E-2. Probes used to collect physical samples (i.e., the lysimeters and vapor port probes) are to be arranged such that all probes within the bundle are installed as close as possible to being equidistant from the targeted waste.

m. The highlighted anomalies vary in size and amplitude, suggesting that the associated metal objects vary in size, composition and/or burial depth. This observation conflicts with inventory records that show the east end soil waste disposals to have essentially uniform size and weight. Burial depth and composition were not recorded.

Table E-2. Proposed Type B probe locations.

Probe Bundles	Easting ^a	Northing ^a
SVR-12 Target Disposal	267859.2	668447.4
SVR12-1-VP	267863.0	668449.9
SVR12-2-VP	267866.8	668452.5
SVR12-3-VP	267870.7	668455.0
SVR12-1-L	267858.2	668443.2
SVR12-1-T	267860.1	668440.9
SVR12-1-G	267859.5	668438.7
SVR12-1-M	26786105	668439.1

a. Coordinates specified in Idaho State Plane, East Zone, NAD27

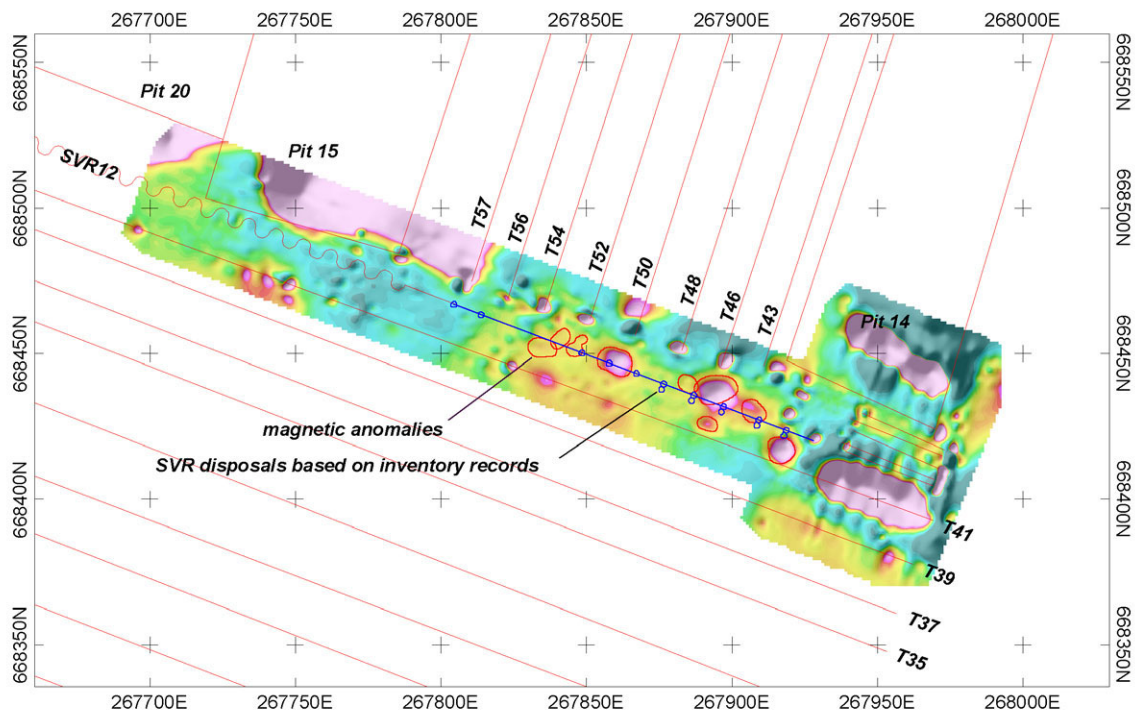


Figure E-1. Vertical gradient magnetic data for the area surrounding SVR-12.

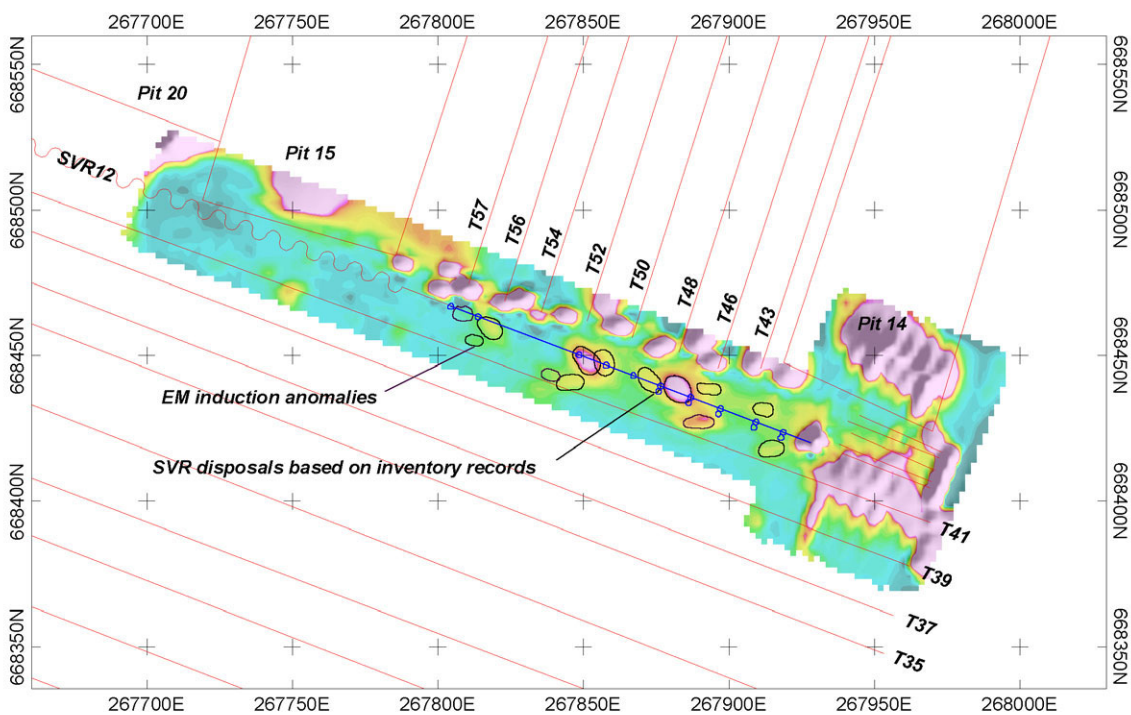


Figure E-2. EM induction data for the area surrounding SVR-12.

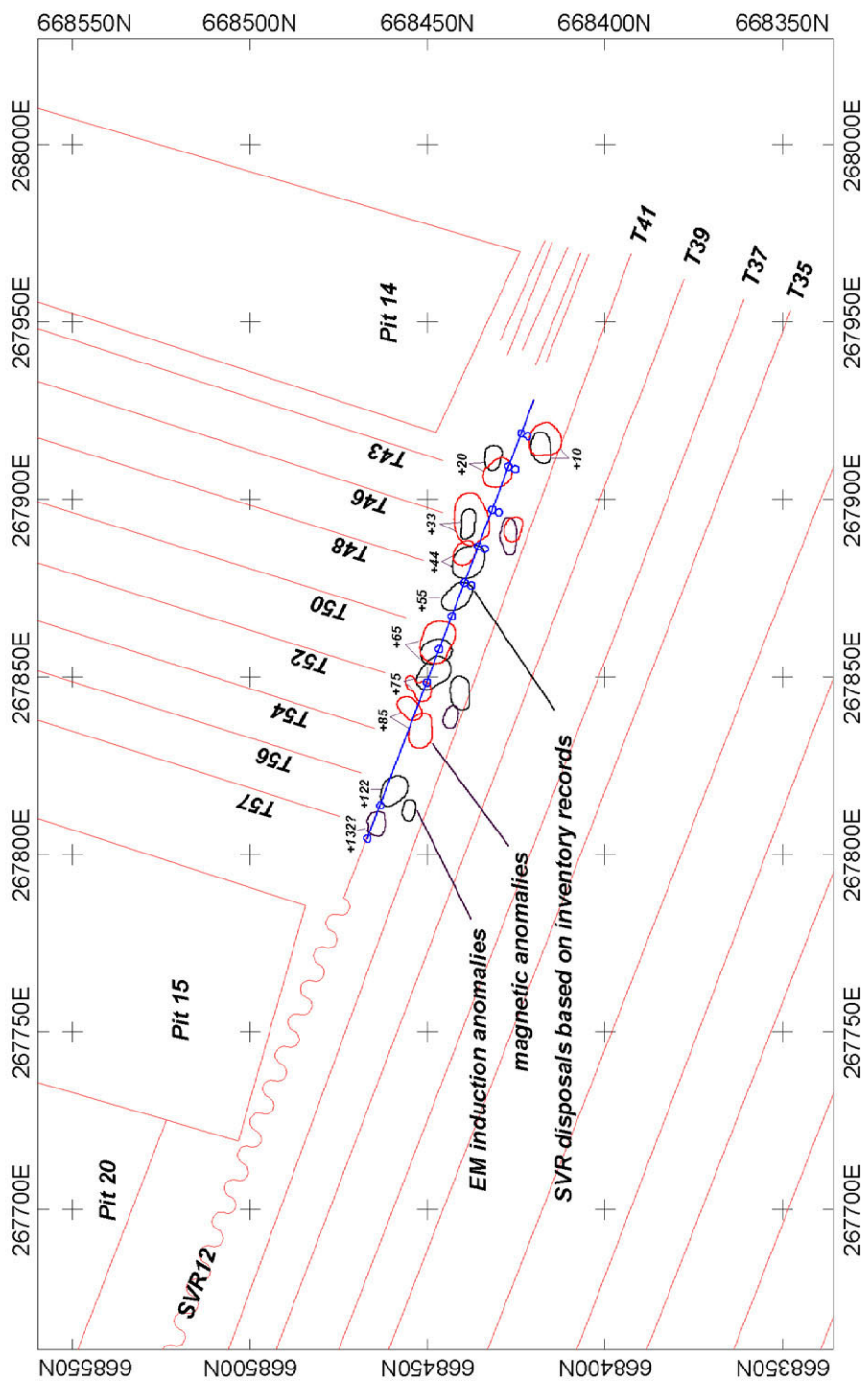


Figure E-3. Geophysical interpretation summary for SVR-12. Labeled anomalies are interpreted to correspond with specific inventory items, based on their position and spacing along the trenchline. Unlabeled anomalies are interpreted to represent objects within the adjacent Trench 41.

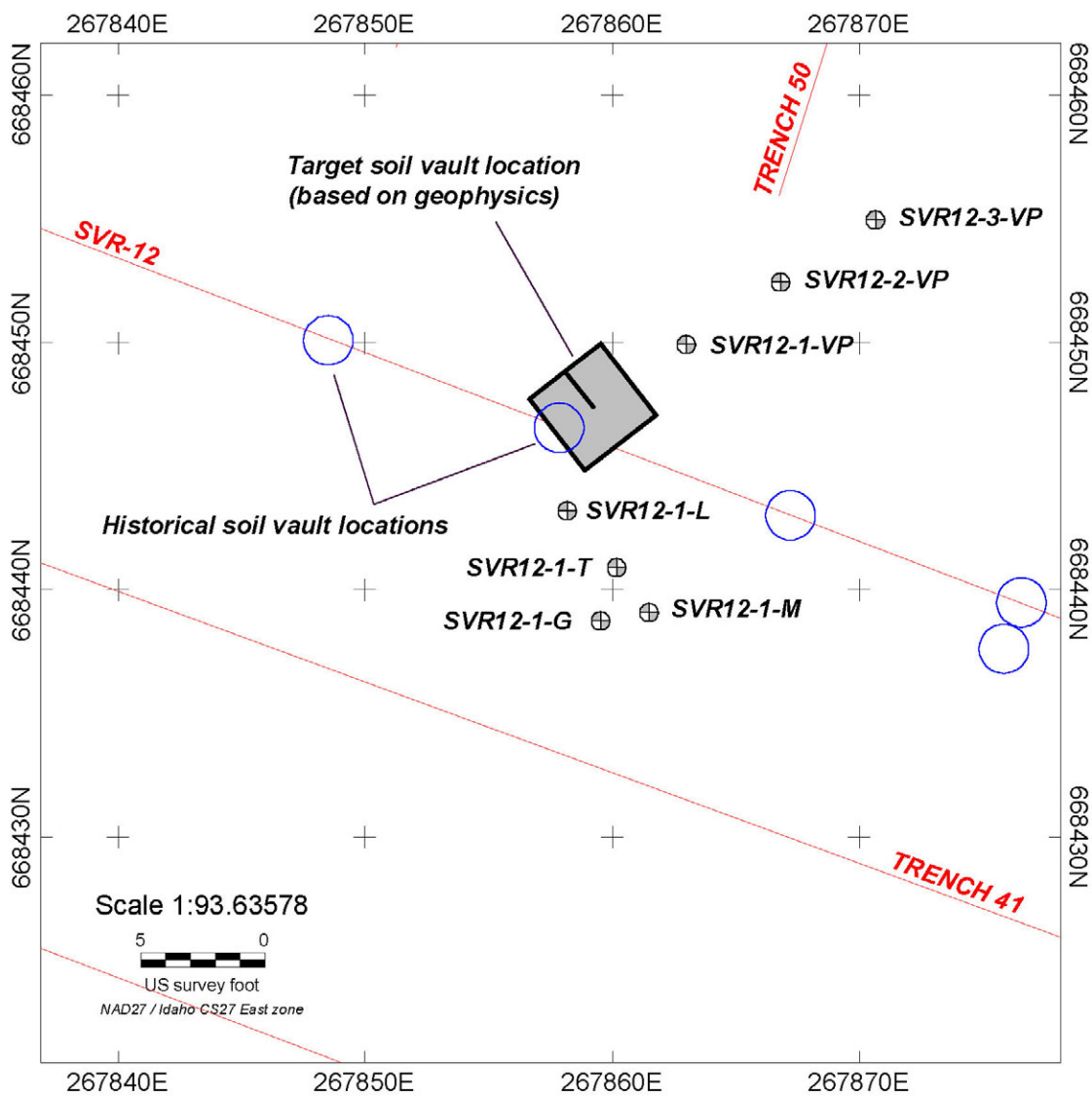


Figure E-4. Proposed location of SVR-12 Type B probe clusters.

Appendix F

Calendar Year 2003–2004 Additions to the Subsurface Disposal Area Probing Project

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Introduction

As a result of programmatic requirements, additional Type A and Type B probes were installed during calendar year (CY) 2003. Additional probe installation may continue during CY 2004 as funding allows. The work will help provide a better understanding of the type and extent of contamination present within the Subsurface Disposal Area (SDA) at the Radioactive Waste Management Complex (RWMC). Data generated from these probes in conjunction with data being generated from existing probes will be used as follows:

- Estimate the current and future cumulative risk to human health and the environment posed by buried waste
- Support the feasibility study development
- Determine source-term inventory of the buried waste
- Support the estimate of the nature and extent of contamination within the buried waste
- Establish the physical and chemical form of contaminants in the buried waste.

The driver for the work is the operable unit (OU) 7-13/14 Scope of Work and OU 7-13/14 Work Plan, to support development of the RI/FS, and draft OU 7-13/14 ROD.

This appendix was prepared to supplement the main body of this plan with new information and procedures relative to the CY 2003 and 2004 work scope. The subsections are arranged to cover the following:

- Sampling objectives, location and frequency
- Sampling equipment and procedures

All other activities regarding the CY 2003–2004 scope are consistent with the main body of this plan.

Sampling Objectives, Location and Frequency

Sampling activities will continue using previously installed probes in the original focus areas described in the main body of this plan; however, additional focus areas are being created as part of the CY 2003–2004 investigation. These new focus areas are known as the following:

- Enriched Uranium Source Focus Area
- Irradiated Fuel Material Focus Area (two areas under investigation)

- Liquid Waste Disposal Focus Area
- Pit 6 High Pu Density Focus Area
- Pit 2 High Pu Density Focus Area.

The Type B probes proposed for installation in existing focus areas were generally planned to replace existing lysimeters or soil moisture probes (SMRs) that had not functioned or produced a sample or in the case of Type A probes, were installed to supplement existing probes within a probe cluster. Table F-1 presents the new SMRs that were installed in November and December 2003, all within existing focus areas. Table F-2 presents Type B+ lysimeters proposed for future installation in existing focus areas. Samples from newly installed lysimeters will be analyzed in accordance with requirements contained in Table 1 of the main body of this plan.

The following subsections detail information used to select a new focus area for further study including information on shipping/disposal records, geophysical data and information gained from performing nuclear logging on the Type A probes installed in the development of the respective focus areas during 2003. These logging results are described in a qualitative sense. Corresponding data are not presented, as detailed analysis has not yet been performed. However a report summarizing the results of the CY 2003-2004 Type A logging activities is expected to be prepared by summer 2004. Figure F-1 depicts the existing focus areas in the SDA including those established with Type A probes installed in 2003. Table F-3 presents a listing of the probes installed in the various focus areas during 2003.

Enriched Uranium Source Focus Area

The Enriched Uranium Source Focus Area, also known as Area 1a, was established to identify enriched uranium waste that could be a source of localized groundwater contamination. Three adjacent Trench 3 disposals, including a shipment disposed on 02/10/55 containing waste from Building 881 appear to have distinct geophysical signatures as seen in Figure F-2. Building 881 has been targeted as a source for enriched uranium (EU) waste as the building was originally established for EU weapons production purposes. Table F-4 presents information on the targeted disposal.

The geophysical signatures in this Focus Area are offset approximately 20 ft west from the location indicated in the inventory disposal records, but were otherwise consistent with the general characteristics of the subject shipments. Four Type A probes were installed and uniformly spaced along the reconstructed RFODOWSR102/10/55800 shipment disposal location to identify EU source waste. The probes were named T3-EU-01 through T3-EU-04 (Figure F-2). This disposal included sixteen 55-gal drums and one 30-gal drum of Building 881 solid waste. However, another fifty-five 55-gal drums originating from Building 444 (associated primarily with Depleted Uranium [DU] component production) were also included in the same shipment, which can complicate evaluation of analytical results if the two uranium wastes are commingled.

Table F-1. Summary of FY04 SMRs installed in preexisting focus areas.

Focus Area	Probe Cluster	Justification	New SMR Location	New Soil Moisture Probes with Sensor IDs and Actual Sensor Installation Depths
Volatile organic compound (VOC) focus	743-03	Replacements for existing nonfunctional SMRs	Install one SMR with two sensors as close as possible on the northwest side of tensiometer 743-03-T3. Install the sensors to reach completion depths of 12.3 and 18.5 ft (proposed).	743-03-M2 12.67' Sensor ID 2000A8 18.75' Sensor ID 2000A6
	743-18	Replacements for existing nonfunctional SMRs	Install one SMR with two sensors as close as possible on the east side of tensiometer 743-18-T3. Install the sensors to reach completion depths of 8 and 19 ft (proposed).	743-18-M2 8.16' Sensor ID 2000B0
	743-18	Replacements for existing nonfunctional SMRs	This additional probe was installed at 743-18 because field conditions prevented the installation of the second (deep sensor) on probe 743-18-M2 as planned.	743-18-M3 19.37' Sensor ID 2000A9
DU focus	DU-08	Replacements for existing nonfunctional SMRs	Install one SMR with three sensors as close as possible on the southwest side of Type A probe DU-08-A. Install the sensors to reach completion depths of 6 ft, 11.5 ft and 18 ft (proposed).	DU-08-M2 6.21' Sensor ID 200099 12.29' Sensor ID 200098 18.37' Sensor ID 2000A0
	DU-10	Replacements for existing nonfunctional SMRs	Install one SMR with one sensor as close as possible on the west side of SMR DU-10-M2. Install the sensor to reach a completion depth of 5.5 ft (proposed).	DU-10-ME 5.67' Sensor ID 200096
	DU-14	Replacement for existing nonfunctional SMRs	Install one SMR with one sensor as close as possible on the southwest side of Type A probe DU-14-A. Install the sensor to reach a completion depth of 12 ft (proposed).	DU-14-M2 12.27' Sensor ID 200097

Table F-2. Summary of Replacement Lysimeters Proposed for Installation in Pre Existing Focus Areas in 2004.

Focus Area	Probe Cluster	Justification	New/Replacement Lysimeter Location	New Lysimeters
Volatile organic compound (VOC) focus	743-05	Based on 743-05 logging data, replacement for 743-03 lysimeters monitoring in the underburden beneath the VOC source.	Southeast side of 743-05, 25 ft deep.	743-05-L1
	743-05	Based on 743-05 logging data, replacement for 743-03 lysimeters monitoring in an interpreted soil layer in the waste zone.	Northwest side of 743-05, 18 ft deep	743-05-L2
	743-11	Based on 743-11 logging data, replacement for 743-08 lysimeters monitoring in the underburden beneath the VOC source.	Southeast side of 743-11, 25 ft deep	743-11-L1
	743-11	Based on 743-11 logging data, replacement for 743-08 lysimeters monitoring in an interpreted soil layer in the waste zone.	Northwest side of 743-11, 20 ft deep	743-11-L2
	743-34	Place lysimeter northwest of 743-34 off the north edge of Pit 4 to ground truth effectiveness of lysimeter in soil only and to observe lateral movement into interpreted low area.	Northing 669370 Easting 267070	743-34-L1
	743-36	743-36 Logging data indicate good source of VOC and PU at this location to 17 ft and underburden down to 25 ft. Lysimeter in underburden will monitor leaching from waste zone.	Northwest side of 743-36, 17 ft deep	743-36-L1
	743-36	743-36 Logging data indicate good source of VOC and PU at this location to 17 ft and underburden down to 25 ft. Lysimeter in underburden will monitor leaching from waste zone.	Southeast side of 743-36, 17 ft deep	743-36-L2
DU focus	DU-11	Replacement for DU-10 lysimeters due to interferences at DU-10, DU-11 nuclear logging shows significant Pu-239 and U-238 with underburden for placement of lysimeters.	Northwest side of DU-11, 17 ft deep	DU-11-L1
	DU-11	Replacement for DU-10 lysimeters due to interferences at DU-10, DU-11 nuclear logging shows significant Pu-239 and U-238 with underburden for placement of lysimeters.	Northeast side of DU-11, 11 ft deep	DU-11-L2

Table F-2. (continued).

Focus Area	Probe Cluster	Justification	New/Replacement Lysimeter Location	New Lysimeters
	DU-14	Replacement lysimeters for existing Type B lysimeters at DU-14.	South of DU-14, 13 ft deep	DU-14-L3
	DU-14	Replacement lysimeters for existing Type B lysimeters at DU-14.	Southwest of DU-14-A, 13 ft deep	DU-14-L4
	DU-15	Replacements for DU-08 lysimeters with best potential for underburden in the focus area.	North of DU-15, 16 ft deep	DU-15-L1
	DU-15	Replacements for DU-08 lysimeters with best potential for underburden in the focus area.	South of DU-15, 16 ft deep	DU-15-L2
Am/Np focus	741-08	Replacement lysimeters for existing non-functioning lysimeters at 741-08.	Northwest side of 741-08-L1, 15.2 ft deep	741-08-L3
	741-08	Replacement lysimeters for existing non-functioning lysimeters at 741-08.	South of 741-08-L2, 7.8 ft deep.	741-08-L4
	741-08	Logging data indicate good source of Pu and DU on north side of 741-08.	Northeast side of 741-08, 15 ft deep, locate as close as possible to 741-08 accommodating drill rig and tensiometer interferences.	741-08-L5
	741-08	Logging data indicate good source of Pu and DU on north side of 741-08.	North side of 741-08, 11 ft deep, locate as close as possible to 741-08 accommodating drill rig and tensiometer interferences.	741-08-L6

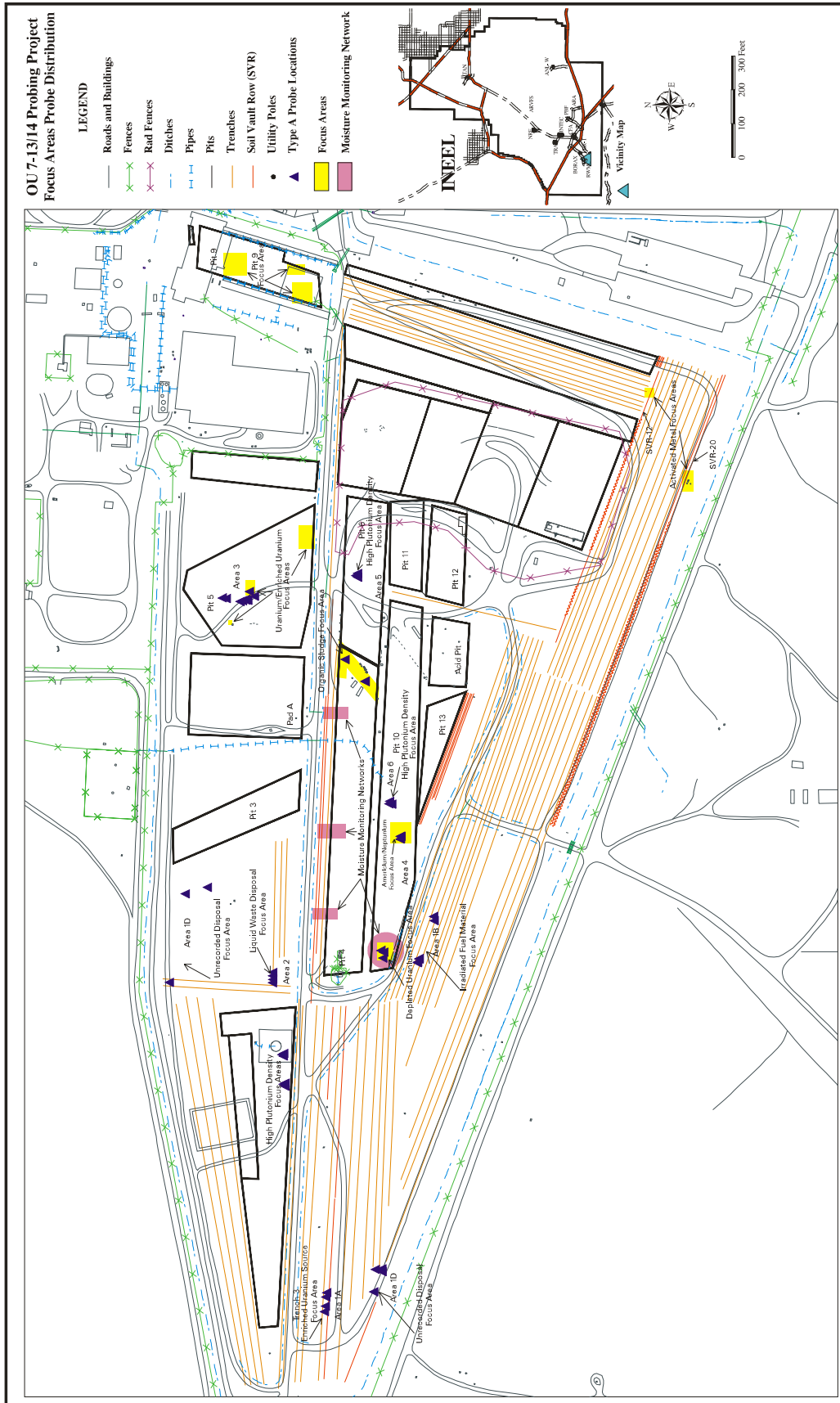


Figure F-1. Existing Focus Areas in the SDA.

Table F-3. Probes installed in the SDA during CY 2003.

Integrated Probing Project Focus Area	Common Probe Name	Probe Type	Installation Date (mm/dd/yyyy)	Probe Depth (ft) (from surface)	Sensor/Port Bottom Depth from Surface (ft)
Americium/Neptunium	741-10	Type A	6/30/2003	20.2	N.A.
Americium/Neptunium	741-11	Type A	6/30/2003	20.1	N.A.
Enriched Uranium Source	T3-EU-01	Type A	6/11/2003	18.4	N.A.
Enriched Uranium Source	T3-EU-02	Type A	6/11/2003	21.8	N.A.
Enriched Uranium Source	T3-EU-03	Type A	6/11/2003	11.9	N.A.
Enriched Uranium Source	T3-EU-04	Type A	6/12/2003	13.5	N.A.
Irradiated Fuel Material	T47-IF-1	Type A	6/10/2003	11.6	N.A.
Irradiated Fuel Material	T47-IF-2	Type A	6/10/2003	10.8	N.A.
Irradiated Fuel Material	T47-IF-3	Type A	6/10/2003	11.6	N.A.
Irradiated Fuel Material	T47-IF-4	Type A	6/10/2003	9.8	N.A.
Liquid Waste Disposal	HAL1	Type A	6/16/2003	20.0	N.A.
Liquid Waste Disposal	HAL2	Type A	6/16/2003	22.4	N.A.
Liquid Waste Disposal	HAL3	Type A	6/16/2003	8.7	N.A.
Liquid Waste Disposal	HAL4	Type A	6/16/2003	12.9	N.A.
Pit 10 High Pu Density	P10-PU-1	Type A	6/25/2003	5.9	N.A.
Pit 10 High Pu Density	P10-PU-2	Type A	6/25/2003	10.4	N.A.
Pit 10 High Pu Density	P10-PU-3	Type A	6/25/2003	20.7	N.A.
Pit 6 High Pu Density	P6-PU-1	Type A	6/23/2003	20.3	N.A.
Pit 6 High Pu Density	P6-PU-2	Type A	6/23/2003	20.3	N.A.
Pit 6 High Pu Density	P6-PU-3	Type A	6/19/2003	8.3	N.A.
Unrecorded Disposal	UD-01	Type A	7/10/2003	10.7	N.A.
Unrecorded Disposal	UD-03	Type A	7/9/2003	4.6	N.A.
Unrecorded Disposal	UD-03B	Type A	7/9/2003	14.9	N.A.
Unrecorded Disposal	UD-04	Type A	7/1/2003	14.4	N.A.
Unrecorded Disposal	UD-05	Type A	7/1/2003	4.7	N.A.
Unrecorded Disposal	UD-05B	Type A	7/2/2003	5.2	N.A.
Unrecorded Disposal	UD-05C	Type A	7/2/2003	5.5	N.A.
Unrecorded Disposal	UD-05D	Type A	7/2/2003	5.6	N.A.
Unrecorded Disposal	UD-05E	Type A	7/7/2003	10.8	N.A.
Uranium/Enriched U	P5-UEU-1	Type A	6/9/2003	18.9	N.A.
Uranium/Enriched U	P5-UEU-2	Type A	6/9/2003	19.1	N.A.
Uranium/Enriched U	P5-UEU-3	Type A	6/9/2003	16.3	N.A.
Uranium/Enriched U	P5-UEU-4	Type A	6/9/2003	17.8	N.A.
Uranium/Enriched U	P5-UEU-5	Type A	6/9/2003	16.3	N.A.
Uranium/Enriched U	P5-UEU-6	Type A	6/9/2003	16.1	N.A.
Uranium/Enriched U	P5-UEU-7	Type A	6/5/2003	13.1	N.A.
Uranium/Enriched U	P5-UEU-8	Type A	6/5/2003	16.1	N.A.
Americium/Neptunium	741-08-C	Type A	11/12/2003	22.16	N.A.
Americium/Neptunium	741-08-D	Type A	11/12/2003	19.26	N.A.
Irradiated Fuel Material	T47-IF-5	Type A	12/11/2003	11.0	N.A.

Table F-3. (continued).

Integrated Probing Project Focus Area	Common Probe Name	Probe Type	Installation Date (mm/dd/yyyy)	Probe Depth (ft) (from surface)	Sensor/Port Bottom Depth from Surface (ft)
Irradiated Fuel Material	T47-IF-6	Type A	12/15/2003	11.7	N.A.
Pit 2 High Pu Density	P2-PU-1	Type A	12/3/2003	19.0	N.A.
Pit 2 High Pu Density	P2-PU-2	Type A	12/4/2003	14.4	N.A.
Pit 2 High Pu Density	P2-PU-3	Type A	12/9/2003	21.0	N.A.
Pit 2 High Pu Density	P2-PU-4	Type A	12/8/2003	13.2	N.A.
Pit 2 High Pu Density	P2-PU-5	Type A	12/8/2003	13.4	N.A.
Pit 2 High Pu Density	P2-PU-6	Type A	12/8/2003	15.5	N.A.
Uranium/Enriched U	P5-UEU-9	Type A	12/10/2003	17.8	N.A.
Depleted Uranium	DU-08-M2	Soil Moisture Probe	11/24/2003	19	18.37 12.29 6.21
Depleted Uranium	DU-10-ME	Soil Moisture Probe	11/20/2003	6.3	5.67
Depleted Uranium	DU-14-M2	Soil Moisture Probe	11/20/2003	12.9	12.27
Organic Sludge	743-03-M2	Soil Moisture Probe	11/25/2003	19.38	18.75 12.67
Organic Sludge	743-18-M2	Soil Moisture Probe	11/26/2003	9	8.16
Organic Sludge	743-18-M3	Soil Moisture Probe	12/2/2003	20	19.37

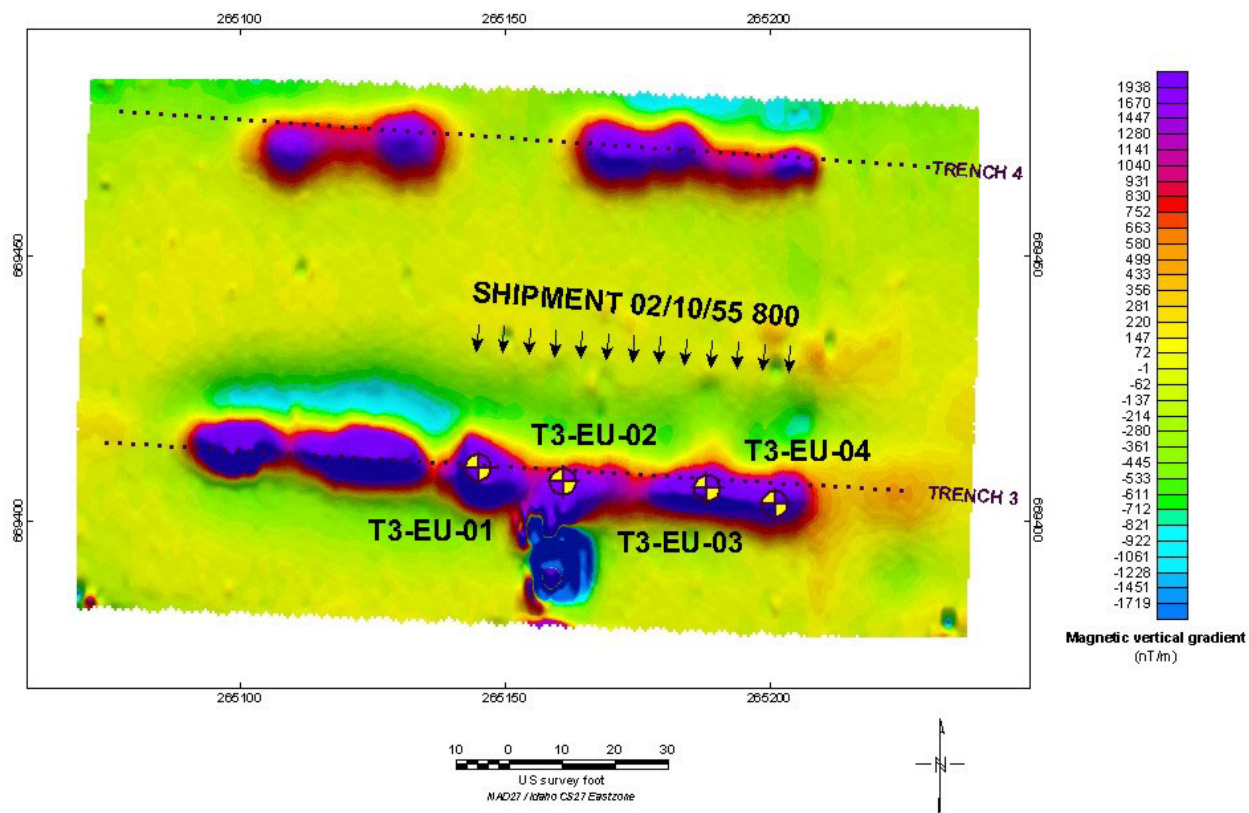


Figure F-2. Enriched uranium source focus area.

Table F-4. Enriched uranium source focus area target disposals.

Site	Disposal Date	Type	Waste Stream	No. Containers	Shipment Weight (?)	Container Type	Contents	Volume (?)	Shipment Number	Location
T3	2/10/1955	I	RFO-DOW-4H	1	200	55 gal	Bldg 881 solid waste	7	RFODOWSR102/10/55800	8+35-85
T3	2/10/1955	IV	RFO-DOW-3H	2	1002	55 gal	Bldg 881 solid waste	15	RFODOWSR102/10/55800	8+35-85
T3	2/10/1955	V	RFO-DOW-9/10H	1	157	30 gal	Bldg 881 solid waste	4	RFODOWSR102/10/55800	8+35-85
T3	2/10/1955	V	RFO-DOW-9/10H	13	4121	55 gal	Bldg 881 solid waste	96	RFODOWSR102/10/55800	8+35-85

Logging results indicate that both fission/activation products (Cs-Co-Eu) and uranium isotopes are present. The uranium contamination observed in probes T3-EU-02 and T3-EU-03 was evaluated to assess the possible presence of enriched uranium waste. The data appear to be indicative of a depleted uranium source, though the data have not yet been corrected for differential gamma-ray attenuation. This would not be surprising, as more drums in the target area originated from a DU facility than an EU facility. Two lysimeters are planned for installation in this Focus Area to gain additional information on the local sources. The probes will be called as follows:

- T3-EU-L1
- T3-EU-L2.

Irradiated Fuel Material Focus Area

The Irradiated Fuel Material Focus Area, also known as area 1b, was established to characterize reactor core and loop component disposals originating from NRF and disposed in Trench 47. Trench 47 was determined to be a good site to investigate these disposals, as indicated by the inventory data contained in Table F-5. Figure F-3 shows the location of the targeted shipments, and locations of the initial Type A probes, T47-IF-1 through T47-IF-4 installed to further evaluate the area. Some wastes with Trench 47 suggest compact, massive metal targets that would be expected to produce prominent magnetic and/or EM anomalies. Inventory data indicate that other metal waste is intermixed with the target shipments in this portion of Trench 47, making positive identification of the target shipments impossible. The initial Type A were placed adjacent to geophysical anomalies that were indicative of massive metal objects in June 2003. All four probes met refusal at 9–11 ft below ground surface. Two additional probes, T47-IF-5 and T47-IF-6, placed in the same area also met refusal at similar depths.

Table F-5. Irradiated fuel material focus area target disposals.

Site	Disposal Date	Type	Waste Stream	No. Containers	Shipment Weight (lbs)	Container Type	Contents	Volume (ft ³)	Shipment Number	Location
T47	6/19/68	I	NRF618	1	26000	Scrap cask	Core and loop components	16	NRF618SR006/19/68810	9+95
T47	6/20/68	I	NRF618	1	26000	Scrap insert	Core and loop components	16	NRF618SR006/20/68800	10+00
T47	6/24/68	I	NRF618	1	26000	Scrap cask	Core and loop components	16	NRF618SR006/24/68820	9+25
T47	6/24/68	I	NRF618	1	26000	Scrap cask	Core and loop components	16	NRF618SR006/25/68800	9+20

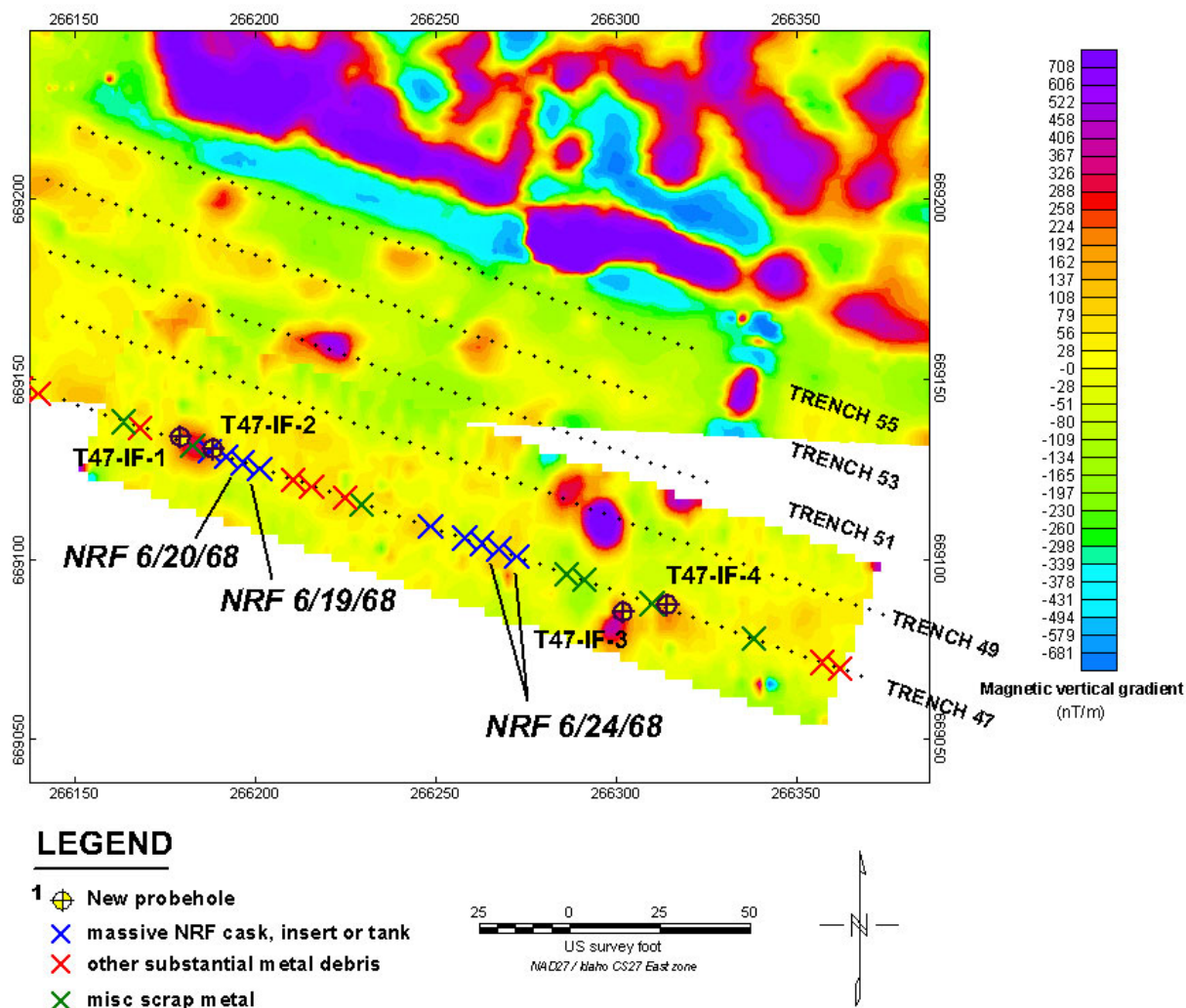


Figure F-3. Irradiated fuel material focus area.

Characteristics of fission/activation product wastes (Cs-Co-Eu isotopes) were observed in all four of the initial probeholes. Significant uranium activities were not detected; however, data are still not available for the most recent probes which were installed in December 2003. Once the data from the last 2 Type A's are evaluated, locations for placement of two additional lysimeters will be selected within T47 to further investigate this focus area. These lysimeters will be named as follows:

- T47-IF-L1
- T47-IF-L2.

Irradiated Fuel Material Focus Area

A second irradiated fuel material focus area, known as Area 1c, is also being investigated. This site has also been referred to as the “East Side Lysimeters,” where lysimeters are being placed between various trenches east of Pit 15. Two Type B+ lysimeters may be placed adjacent to two deep vadose zone lysimeters installed in April 2004 between Trench 48 and Trench 50 (deep vadose zone lysimeter RMWC-2004) and between Trench 46 and Trench 48 (deep vadose zone lysimeter RWMC-2006). An additional Type B+ lysimeter is also planned for installation at the site known as RWMC-2005 where slight contamination was encountered during drilling to support installation of a deep lysimeter. The contamination caused suspension of drilling and the path forward included installation of a standard lysimeter and tensionmeter at 8.9 ft below land surface in the hole drilled for RWMC-2005. The third Type B+ lysimeter is planned for installation to basalt adjacent to RWMC-2005. This location is also located between Trench 46 and Trench 48, about 50 ft north of RWMC-2006. These probes, located on the east end of the SDA, will be used to monitor the vadose zone above basalt. The Type B+ lysimeters will be called:

- T50-IF-L1 (adjacent to RWMC-2004)
- T48N-IF-L1 (adjacent to the hole drilled at RWMC-2005)
- T48S-IF-L1 (adjacent to RWMC-2006).

Liquid Waste Disposal Area

The Liquid Waste Disposal Focus Area, also known as area 2, was established to study several liquid waste disposal targets in Trench 24 that originated from the Naval Reactor Facility (NRF). The liquids were believed to be co-disposed with diatomaceous absorbent material. Nothing in the disposal descriptions indicates that the shipments contained significant buried metal. No conductivity or metal-related geophysical anomalies were observed. Type A probes were positioned at the far west end of Trench 24, based on the targeted inventory records only. Inventory data for the targeted disposals are given in the Table F-6 below.

Table F-6. Liquid waste disposal focus area waste target disposals.

Site	Disposal Date	Type	Waste Stream	No. Containers	Shipment Weight (lbs)	Container Type	Contents	Volume (yd ³)	Shipment Number	Location
T24	5/10/62	O	NRF618	1	-	tanker	Celite	1	NRF618SR005/10/62800	West end
T24	7/30/62	O	NRF618	1	10000	tanker	Celite	1	NRF618SR007/30/62800	West end

Figure F-4 shows the location of the targeted shipments and four Type A probes, HAL1 through HAL4, installed in June 2003 to evaluate this site. HAL1 and HAL2 penetrated to 20–22 ft below ground surface. HAL3 and HAL4, although located only 10–20 feet further east, penetrated to only 8–12 ft below ground surface.

No Pu-Am-Np, uranium, or significant chlorine contamination was observed in any of the Liquid Waste Disposal Focus Area probes. Cs-137 is observed in all the probes, accompanied by Co-60 in HAL2 and HAL4, and by Eu-154 in HAL2. The total gamma activity observed in HAL2 was sufficient to saturate the measurement system throughout an 8.5 ft depth interval such that no useful gamma-ray data were obtained.

The Cs-Co count rate in HAL4 increases abruptly in the bottom few feet of the probe, suggesting that the contamination zone continues below the probe bottom. This may reflect contamination that has migrated into basalt or other hard layer beneath the waste zone, or it may mean that the probe struck impenetrable waste at the refusal depth. In either case, it is impossible to determine the peak contamination level for these zones.

The moisture logs for all four probes are very similar, suggesting a common soil and waste environment with depth throughout the probe area. This observation provides no explanation for the large difference in refusal depth for HAL3 and HAL4 compared with HAL1 and HAL2.

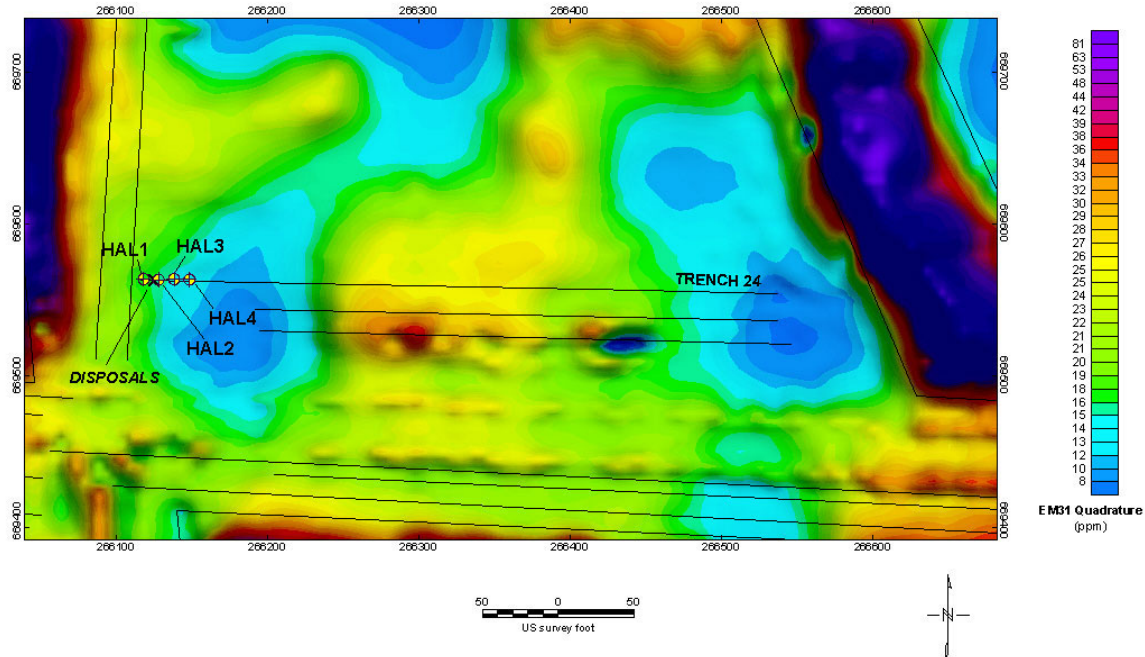


Figure F-4. Liquid waste disposal focus area.

Two Lysimeters and two SMRs are planned for installation around HAL2 to obtain additional information on the source causing the measurement saturation around this Type A probe. The Type B+ lysimeters will be called as follows:

- HAL2-L1
- HAL2-L2.

The Type B SMRs will be called as follows:

- HAL2-M1
- HAL2-M2.

Uranium/Enriched Uranium (Pit 5) Focus Area

In 2001, a focus area was established in Pit 5 primarily to investigate anthropogenic sources of uranium contained in the pit. This area is known as the Uranium/Enriched Uranium Focus area and has also been called area 3. The initial planning investigation is contained in Section 3.2.4 of the main body of this plan. This section is used as a supplement to describe the rationale for new probes being installed in

Pit 5. In June 2003, eight Type A probes (P5-UEU-1 through P5-UEU-8) were installed within portions of Pit 5 believed to contain Rocky Flats Plant waste (Figure F-5). One additional Type A probe was installed in December 2003 as well (P5-UEU-9). The target shipments consisted of 55-gal drums containing waste from Building 776, Building 881, and graphite waste. These shipments could contain highly enriched uranium or significant sources of Pu-239. Most of the Pit 5 disposal locations were recorded as single point disposals (indicated by circles on Figure F-5), but some were recorded as disposed in defined areas (represented by rectangles). The initial Type A probe locations were selected based on (a) the presence of Building 776, 881 and/or graphite disposals, (b) nearby magnetic or EM anomalies that indicate the presence of metal, and (c) proximity to a shipment recorded over a defined area (not a point disposal), if possible.

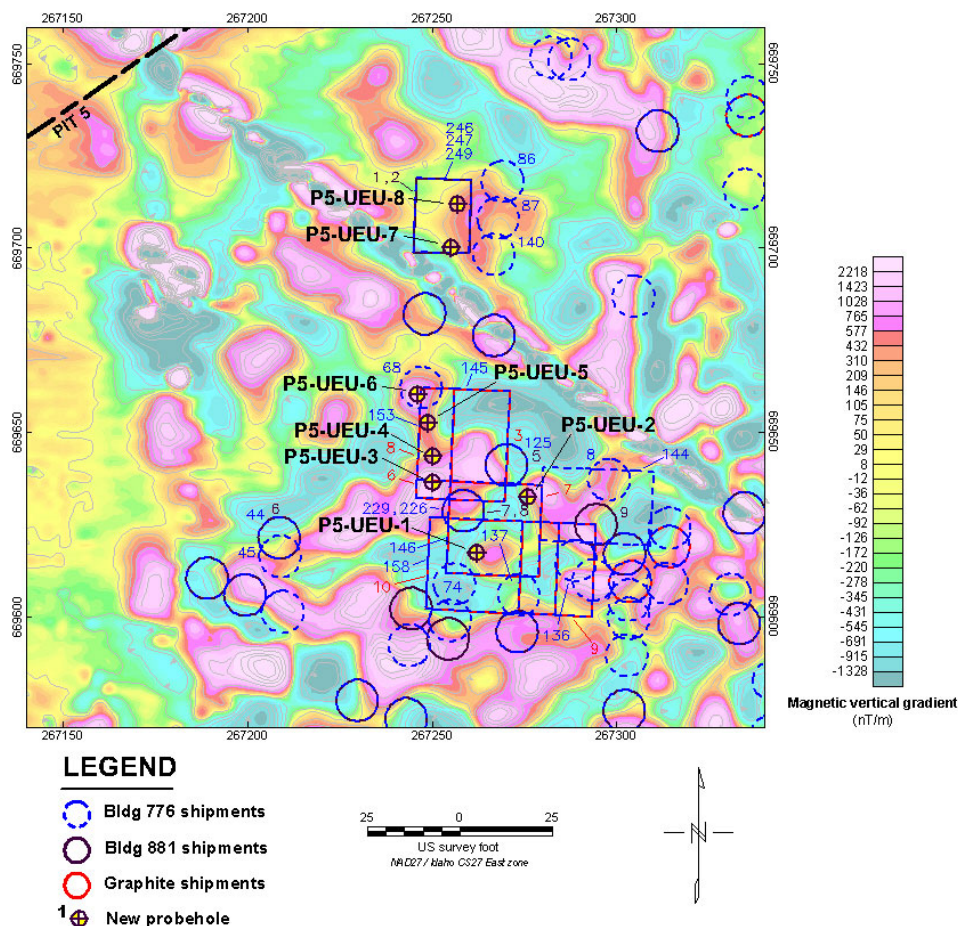


Figure F-5. Uranium/enriched uranium focus area.

Figure F-5 shows the targeted disposals and their relationship to the new Type A probes. Disposals of interest are listed in Table F-7. Note that for each record in this table, “No. containers” refers to the number of containers of the specific waste type described in the record, while “Description” lists the total number of containers of all waste types in the associated waste shipment.

All eight of the initial probes encountered high levels of Pu-Am-Np, and most contained uranium isotopes. A unique characteristic of what was found is the relatively large thickness of the Pu-Am-Np contamination zone, which appears to be sustained over a vertical interval of 8–9 ft. Very high chlorine detections were also observed. The Pu-Am-Np, uranium, and chlorine contamination zones are all closely

correlated and give the general impression of two vertically stacked waste zones. The similarity between the logging results for these probes is somewhat surprising since the probes are scattered along nearly 100 ft of Pit 5, and are associated with several distinctly separate geophysical anomalies. Elevated thorium is also observed to coincide with some, but not all Pu-Am-Np detections. Elevated thorium has been observed in logging data elsewhere in the SDA, but the source and significance of this is not yet known.

Table F-7. Uranium/enriched uranium focus area waste target disposals.

MAP_ID	Document ID	Disposal date	Generator	Type	Waste Stream ID	No. containers	Container type	Weight (lbs)	Volume (ft ³)	Description
GRAPHITE SHIPMENTS										
1	RFODOWSR107/22/6681020	22-Jul-66	776	Graphite	RFO-DOW-11H	11	55-gal	3602	81	(1) 224 55-gal drums of paper, rags, glass, scrap metal, etc. (Unknown weight of U, Pu; unknown total curies)
2	RFODOWSR109/16/6680020	16-Sep-66	771	Type I / Graphite	RFO-DOW-4H, 11H	17	55-gal	3876	125	(1) 149 (55-gal) drums of rags, paper, metal, glass, etc. (Unknown weight of U, Pu; unknown total curies)
2	RFODOWSR109/16/6680020	16-Sep-66	771	Type V / Graphite	RFO-DOW-9/10, 11H	3	55-gal	1170	22	(1) 149 (55-gal) drums of rags, paper, metal, glass, etc. (Unknown weight of U, Pu; unknown total curies)
2	RFODOWSR109/16/6680020	16-Sep-66	776	Graphite	RFO-DOW-11H	9	55-gal	2779	66	(1) 149 (55-gal) drums of rags, paper, metal, glass, etc. (Unknown weight of U, Pu; unknown total curies)
3	RFODOWSR109/16/6681020	16-Sep-66	771	Type I / Graphite	RFO-DOW-4H, 11H	14	55-gal	2858	103	(1) 150 (55-gal) drums of rags, paper, metal, glass, etc. (Unknown weight of U, Pu; unknown total curies)
3	RFODOWSR109/16/6681020	16-Sep-66	771	Type V / Graphite	RFO-DOW-9/10, 11H	6	55-gal	1800	44	(1) 150 (55-gal) drums of rags, paper, metal, glass, etc. (Unknown weight of U, Pu; unknown total curies)
3	RFODOWSR109/16/6681020	16-Sep-66	776	Type V / Graphite	RFO-DOW-9/10, 11H	1	55-gal	223	7	(1) 150 (55-gal) drums of rags, paper, metal, glass, etc. (Unknown weight of U, Pu; unknown total curies)
3	RFODOWSR109/16/6681020	16-Sep-66	776	Graphite	RFO-DOW-11H	16	55-gal	5012	118	(1) 150 (55-gal) drums of rags, paper, metal, glass, etc. (Unknown weight of U, Pu; unknown total curies)
4	RFODOWSR109/23/6680020	23-Sep-66	444	Type V / Graphite	RFO-DOW-9/10, 11H	1	55-gal	381	7	(1) 152 (55-gal) drums of rags, paper, metal, glass, etc. (Unknown weight of U, Pu; unknown total curies)
5	RFODOWSR109/23/6681010	23-Sep-66	776	Type LGW	RFO-DOW-11H	3	55-gal	387	22	(1) 32 (55-gal) drums of 74 series sludge, (2) 193 (55-gal) drums of rags, paper, metal, glass, etc. (Unknown weight of U, Pu; unknown total curies)
6	RFODOWSR110/21/6681010	21-Oct-66	771	Graphite	RFO-DOW-11H	24	55-gal	6181	176	(1) 150 55-gal. drums containing scrap metal, rags, paper, glass, graphite (Unknown weight of U, Pu; unknown total curies)
7	RFODOWSR110/21/6682010	21-Oct-66	771	LGW / Type I	RFO-DOW-11H, 4H	1	55-gal	76	7	(1) 150 55-gal. drums containing rags, paper, scrap metal, graphite, glass, etc. (Pu of unknown amount)
7	RFODOWSR110/21/6682010	21-Oct-66	771	Graphite	RFO-DOW-11H	20	55-gal	5359	147	(1) 150 55-gal. drums containing rags, paper, scrap metal, graphite, glass, etc. (Pu of unknown amount)
7	RFODOWSR110/21/6682010	21-Oct-66	771	Type I W / Graphite	RFO-DOW-4H, 11H	23	55-gal	4563	169	(1) 150 55-gal. drums containing rags, paper, scrap metal, graphite, glass, etc. (Pu of unknown amount)
7	RFODOWSR110/21/6682010	21-Oct-66	771	Type V W / Graphite	RFO-DOW-4H, 9/10H, 11H	1	55-gal	130	7	(1) 150 55-gal. drums containing rags, paper, scrap metal, graphite, glass, etc. (Pu of unknown amount)
7	RFODOWSR110/21/6682010	21-Oct-66	771	LGW / Type V	RFO-DOW-11H, 9/10H	1	55-gal	140	7	(1) 150 55-gal. drums containing rags, paper, scrap metal, graphite, glass, etc. (Pu of unknown amount)
7	RFODOWSR110/21/6682010	21-Oct-66	776	LGW / Type V	RFO-DOW-11H, 9/10H	3	55-gal	327	22	(1) 150 55-gal. drums containing rags, paper, scrap metal, graphite, glass, etc. (Pu of unknown amount)
8	RFODOWSR111/04/6682010	4-Nov-66	771	Type V / Graphite	RFO-DOW-9/10, 11H	1	55-gal	348	7	(1) 152 55-gal. drums containing rags, paper, scrap metal, graphite, glass, etc. (Pu of unknown amount)

Table F-7. (continued).

MAP ID	Document ID	Disposal date	Generator	Type	Waste Stream ID	No. containers	Container type	Weight (lbs)	Volume (ft ³)	Description
9	RFODOWSR111/11/6681010	11-Nov-66	444	Type V/ Graphite	RFO-DOW-9/10, 11H	2	55-gal	898	15	(1) 154 55-gal. drums of metal, paper, glass, rags, etc. (Unknown weight of U, Pu; unknown total curies)
9	RFODOWSR111/11/6681010	11-Nov-66	771	Type I W/ Graphite	RFO-DOW-4H, 11H	2	55-gal	263	15	(1) 154 55-gal. drums of metal, paper, glass, rags, etc. (Unknown weight of U, Pu; unknown total curies)
9	RFODOWSR111/11/6681010	11-Nov-66	771	Type V/ Graphite	RFO-DOW-9/10, 11H	1	55-gal	134	7	(1) 154 55-gal. drums of metal, paper, glass, rags, etc. (Unknown weight of U, Pu; unknown total curies)
10	RFODOWSR111/11/6682010	11-Nov-66	444	Type V/ Graphite	RFO-DOW-9/10, 11H	3	55-gal	1230	22	(1) 220 55-gal. drums containing metal, rags, paper, glass, etc. (2) 1 30-gal drum containing metal, rags, paper, glass, etc. (Unknown weight of U, Pu; unknown total curies)
10	RFODOWSR111/11/6682010	11-Nov-66	771	Type I/ Graphite	RFO-DOW-4H, 11H	2	55-gal	417	15	(1) 220 55-gal. drums containing metal, rags, paper, glass, etc. (2) 1 30-gal drum containing metal, rags, paper, glass, etc. (Unknown weight of U, Pu; unknown total curies)
10	RFODOWSR111/11/6682010	11-Nov-66	771	Type V/ Graphite	RFO-DOW-9/10, 11H	4	55-gal	795	29	(1) 220 55-gal. drums containing metal, rags, paper, glass, etc. (2) 1 30-gal drum containing metal, rags, paper, glass, etc. (Unknown weight of U, Pu; unknown total curies)
10	RFODOWSR111/11/6682010	11-Nov-66	771	Type V W/ Graphite	RFO-DOW-4H, 9/10H, 11H	2	55-gal	247	15	(1) 220 55-gal. drums containing metal, rags, paper, glass, etc. (2) 1 30-gal drum containing metal, rags, paper, glass, etc. (Unknown weight of U, Pu; unknown total curies)
10	RFODOWSR111/11/6682010	11-Nov-66	776	Type V/ Graphite	RFO-DOW-9/10, 11H	3	55-gal	927	22	(1) 220 55-gal. drums containing metal, rags, paper, glass, etc. (2) 1 30-gal drum containing metal, rags, paper, glass, etc. (Unknown weight of U, Pu; unknown total curies)
BUILDING 776 SHIPMENTS										
8	RFODOWSR105/13/66800190	20-May-66	776	Type V	RFO-DOW-9/10H	38	55-gal drum(s)	9007	279	(1) 32 (55-gal) drums of 74 series sludges. (2) 118 (55-gal) drums of paper, rags, scrap metal, etc. (U, Pu of unknown amount)
44	RFODOWSR103/27/6580010	30-Mar-65	776	Type V	RFO-DOW-9/10H	31	wooden box(es)	5825	569	
45	RFODOWSR103/27/6581010	30-Mar-65	776	Type V	RFO-DOW-9/10H	31	wooden box(es)	4150	406	(1) 18 boxes of paper, rags, scrap metal, etc. (U, Pu of unknown amount)
68	RFODOWSR104/22/6682010	29-Apr-66	776	Type I, Type V	RFO-DOW-4H, 9/10H	9	wooden box(es)	8700	747	
74	RFODOWSR105/20/6680010	27-May-66	776	Type I, Type V	RFO-DOW-4H, 9/10H	6	wooden box(es)	16900	1297	(1) 7 wooden boxes containing paper, rags, scrap metal, machinery, etc. (U, Pu of unknown amount)
86	RFODOWSR106/10/6680010	17-Jun-66	776	Type I	RFO-DOW-4H	6	55-gal drum(s)	985	44	
86	RFODOWSR106/10/6680010	17-Jun-66	776	Type V	RFO-DOW-9/10H	1	55-gal drum(s)	227	7	
87	RFODOWSR106/10/6681040	17-Jun-66	776	Type V	RFO-DOW-9/10H	3	55-gal drum(s)	951	22	
125	RFODOWSR109/16/6681020	23-Sep-66	776	Type V, Graphite	RFO-DOW-9/10, 11H	1	55-gal drum(s)	223	7	
125	RFODOWSR109/16/6681020	23-Sep-66	776	Type I, Type V	RFO-DOW-4H, 9/10H	36	55-gal drum(s)	4097	266	
125	RFODOWSR109/16/6681020	23-Sep-66	776	Type V	RFO-DOW-9/10H	3	55-gal drum(s)	779	22	
125	RFODOWSR109/16/6681020	23-Sep-66	776	Graphite	RFO-DOW-11H	16	55-gal drum(s)	5012	118	

Table F-7. (continued).

MAP_ID	Document ID	Disposal date	Generator	Type	Waste Stream ID	No. containers	Container type	Weight (lbs)	Volume (ft ³)	Description
125	RFODOWSR109/16/6681020	23-Sep-66	776	Type I	RFO-DOW-4H	3	55-gal drum(s)	521	22	
136	RFODOWSR110/07/6681010	14-Oct-66	776	Type I	RFO-DOW-4H	2	55-gal drum(s)	342	15	
136	RFODOWSR110/07/6681010	14-Oct-66	776	Type V	RFO-DOW-9/10H	2	55-gal drum(s)	381	15	
137	RFODOWSR110/07/6683010	14-Oct-66	776	Type I	RFO-DOW-4H	7	55-gal drum(s)	1175	51	
137	RFODOWSR110/07/6683010	14-Oct-66	776	Type V	RFO-DOW-9/10H	14	55-gal drum(s)	4187	103	
140	RFODOWSR110/17/6680010	20-Oct-66	776	Type V	RFO-DOW-9/10H	1	55-gal drum(s)	230	7	
140	RFODOWSR110/17/6680010	20-Oct-66	776	Type I	RFO-DOW-4H	42	55-gal drum(s)	4690	309	
144	RFODOWSR110/21/6680010	28-Oct-66	776	Type I	RFO-DOW-4H	1	55-gal drum(s)	155	7	
144	RFODOWSR110/21/6680010	28-Oct-66	776	Type V	RFO-DOW-9/10H	4	55-gal drum(s)	851	29	
145	RFODOWSR110/21/6681010	28-Oct-66	776	Type I, Type V	RFO-DOW-4H, 9/10H	41	55-gal drum(s)	7379	301	
145	RFODOWSR110/21/6681010	28-Oct-66	776	Type V	RFO-DOW-9/10H	1	55-gal drum(s)	307	7	
145	RFODOWSR110/21/6681010	28-Oct-66	776	Graphite	RFO-DOW-11H	1	55-gal drum(s)	339	7	
145	RFODOWSR110/21/6681010	28-Oct-66	776	Type V, Graphite	RFO-DOW-9/10, 11H	1	55-gal drum(s)	327	7	
146	RFODOWSR110/21/6682010	28-Oct-66	776	LGW, Type V	RFO-DOW-11H, 9/10H	3	55-gal drum(s)	327	22	
153	RFODOWSR111/04/6682010	11-Nov-66	776	Type I	RFO-DOW-4H	33	55-gal drum(s)	3491	243	
158	RFODOWSR111/11/6682010	18-Nov-66	776	Type I	RFO-DOW-4H	79	55-gal drum(s)	7245	581	
158	RFODOWSR111/11/6682010	18-Nov-66	776	Type V	RFO-DOW-9/10H	19	55-gal drum(s)	4528	140	
158	RFODOWSR111/11/6682010	18-Nov-66	776	Type V, Graphite	RFO-DOW-9/10, 11H	3	55-gal drum(s)	927	22	
226	RFODOWSR105/09/64840	12-May-64	776	Type V	RFO-DOW-9/10H	70	wooden box(es)	11400	1380	(1) 2- wooden boxes containing scrap steel deep freezers (U, Pu of unknown amount)
229	RFODOWSR105/09/64910	13-May-64	776	Type I, Type V	RFO-DOW-4H, 9/10H	14	wooden box(es)	2100	141	
246	RFODOWSR110/10/64840	13-Oct-64	776	Type V	RFO-DOW-9/10H	2	wooden box(es)	1925	139	
247	RFODOWSR110/10/64850	13-Oct-64	776	Type V	RFO-DOW-9/10H	2	wooden box(es)	1900	139	
249	RFODOWSR110/10/64910	13-Oct-64	776	Type V	RFO-DOW-9/10H	2	wooden box(es)	2000	85	
BUILDING 881 SHIPMENTS										
1	RFODOWSR110/10/64900	13-Oct-64	881	Type V	RFO-DOW-9/10H	2	wooden box(es)	10650	556	
2	RFODOWSR110/10/64910	13-Oct-64	881	Type V	RFO-DOW-9/10H	2	wooden box(es)	2000	58	
5	RFODOWSR109/16/6681020	23-Sep-66	881	Type I, Type V	RFO-DOW-18H-V, 11H-V, 6H-III, 4H-I	6	55-gal drum(s)	790	44	
6	RFODOWSR103/27/6580010	30-Mar-65	881	Type V	RFO-DOW-9/10H	31	wooden box(es)	3050	241	
7	RFODOWSR105/09/64900	13-May-64	881	Type V	RFO-DOW-9/10H	14	wooden box(es)	12100	382	
8	RFODOWSR105/09/64910	13-May-64	881	Type V	RFO-DOW-9/10H	48	wooden box(es)	5050	282	
9	RFODOWSR108/12/6681020	19-Aug-66	886	Type I, Type V	RFO-DOW-4H, 9/10H	14	55-gal drum(s)	1428	103	

Table F-7. (continued).

MAP_ID	Document ID	Disposal date	Generator	Type	Waste Stream ID	No. containers	Container type	Weight (lbs)	Volume (ft ³)	Description
9	RFODOWSR108/12/6681020	19-Aug-66	881	Type I	RFO-DOW-4H	2	55-gal drum(s)	353	15	
9	RFODOWSR108/12/6681020	19-Aug-66	881	Type V	RFO-DOW-9/10H	7	55-gal drum(s)	1835	51	
9	RFODOWSR108/12/6681020	19-Aug-66	881	Type I, Type V	RFO-DOW-4H, 9/10H	36	55-gal drum(s)	3992	265	
9	RFODOWSR108/12/6681020	19-Aug-66	883	Type I	RFO-DOW-4H	11	55-gal drum(s)	1412	81	
9	RFODOWSR108/12/6681020	19-Aug-66	883	Type I, Type V	RFO-DOW-4H, 9/10H	56	55-gal drum(s)	18483	411	
9	RFODOWSR108/12/6681020	19-Aug-66	883	Type IV	RFO-DOW-15H	4	55-gal drum(s)	2970	29	
9	RFODOWSR108/12/6681020	19-Aug-66	883	Type I	RFO-DOW-4H	1	30-gal drum(s)	248	4	

Six additional Type B probes are planned for this area. The Type B+ lysimeters will be called as follows:

- P5-TW1-L2
- P5-4-L2
- P5-UEU-L1
- P5-UEU-L2.

The Type B SMRs will be called as follows:

- P5-UEU-M
- P5-UEU-MB.

Pit 6 High Pu Density Focus Area

The Pit 6 High Pu Density Focus Area, also known as area 5, was established to characterize RFP drum shipments suspected to contain significant sources of Pu contaminated waste. Initial Type A probe locations were selected by EPA and IDEQ based on disposal inventory data from 2 RFP shipments. Table F-8 contains information on these target disposals. The target disposals, along with the three Type A probes installed in June 2003 to support initial characterization of this area, are represented on Figure F-6.

Probes P6-PU-1 and P6-PU-2 were installed to a depth of 20.0 ft. Probe P6-PU-3 met refusal at 8.0 ft, where it is suspected to have struck impenetrable waste. Moisture and passive gamma-ray log data at the bottom of P6-PU-3 suggest the onset of a Pu-Am-Np waste zone at 7.5–8.0 ft.

Probes P6-PU-1 and P6-PU-2 encountered high levels of Pu-Am-Np with P6-PU-1 data indicating the highest apparent Am-241 concentration observed anywhere in SDA to date. U-238 and chlorine were observed sporadically in this area, but at much lower levels than observed in other areas. Elevated thorium was also detected in some areas within this focus area.

The apparent presence of a thick soil layer beneath the waste in P6-PU-1 and P6-PU-2 offers an opportunity to evaluate the possible migration of radionuclides into the underburden. To support this evaluation, two lysimeters and one SMR are planned for installation in close proximity to P6-PU-1. The lysimeters will be called as follows:

- P6-PU-L1
- P6-PU-L2.

The SMR will be called P6-PU-M.

Table F-8. Pit 6 High Pu Density Focus Area Target Disposals.

Site	Disposal Date	Type	Waste Stream	No. Containers	Shipment Weight (lbs)	Container Type	Contents	Volume (yd ³)	Shipment Number	Location
6	6/25/1968	LGW	RFO-DOW-11H	15	1504	55-gal drum(s)	(1) 24 55-gal drums containing paper, plastic, scrap metal, etc. (2) 52 55-gal drums containing Series 74 sludges (3) 54 Boxed 55-gal drums (Pu of unknown curie amount)	110	RFODOWSR106/17/68900	200-220' East & 35-50' South of N/W Monument
6	6/25/1968	Type V	RFO-DOW-9/10H	9	1157	55-gal drum(s)		66	RFODOWSR106/17/68900	200-220' East & 35-50' South of N/W Monument
6	6/25/1968	Type IV	RFO-DOW-3H	52	26709	55-gal drum(s)		382	RFODOWSR106/17/68900	200-220' East & 35-50' South of N/W Monument
6	6/25/1968	Empty		54	3556	55-gal drum(s)		664	RFODOWSR106/17/68900	200-220' East & 35-50' South of N/W Monument
6	6/26/1968	Type I, Type V	RFO-DOW-4H, 9/10H	15	1917	55-gal drum(s)	(1) 25 55-gal drums containing paper, plastic, scrap metal, etc. (2) 52 55-gal drums containing Series 74 sludges (3) 57 Boxed 55-gal drums (Pu of unknown curie amount)	110	RFODOWSR106/17/68940	212' East & 35-45' south of N/W Monument
6	6/26/1968	Type V	RFO-DOW-9/10H	9	1141	55-gal drum(s)		66	RFODOWSR106/17/68940	212' East & 35-45' south of N/W Monument
6	6/26/1968	Type IV	RFO-DOW-3H	52	26279	55-gal drum(s)		382	RFODOWSR106/17/68940	212' East & 35-45' south of N/W Monument
6	6/26/1968	Empty		57	3537	55-gal drum(s)		701	RFODOWSR106/17/68940	212' East & 35-45' south of N/W Monument

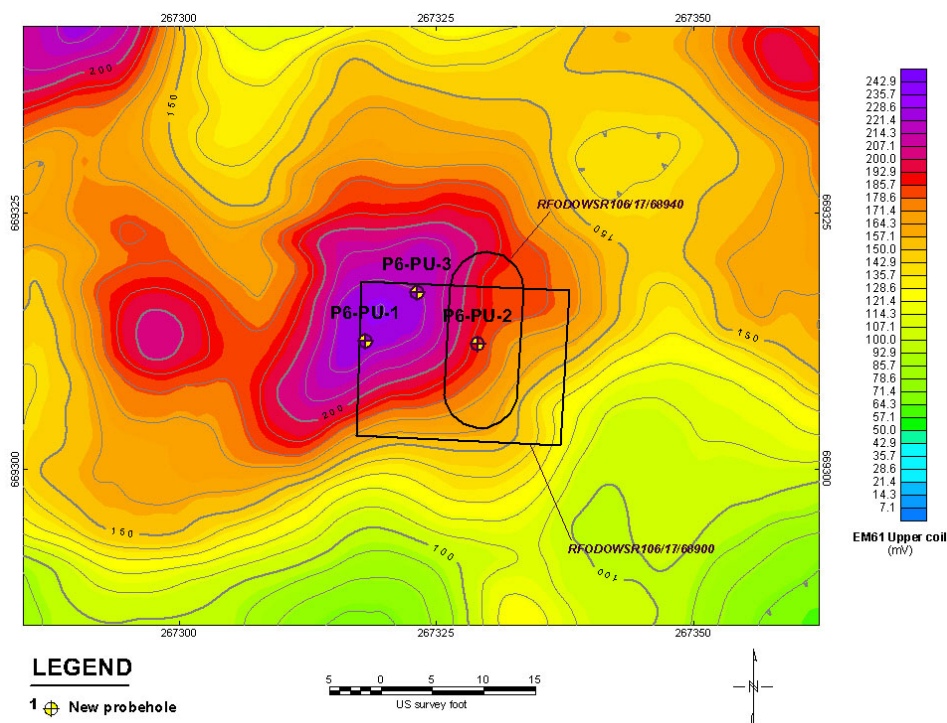


Figure F-6. Pit 6 High Pu Density Focus Area.

Pit 2 High Pu Density Focus Area

The Pit 2 High Pu Density Focus Area, also known as area 7, was established to characterize RFP drum shipments/disposals containing graphite molds, a waste expected to contain significant Pu source material. The following search criteria were used on WasteOScope to select material potentially containing graphite molds:

- generator = Building 776 (Pu casting and parts fabrication)
- waste type = Type 5 (noncombustible)
- weight \approx 200 lb.

Table F-9 lists the disposals of interest identified as a result of the WasteOScope query. Two waste groupings were identified that were disposed in relative proximity to each other. Those areas contain the greatest concentration of drums meeting the WasteOScope search criteria. Historical documents indicate that Pit 2 waste drums were carefully stacked in rows, rather than dumped, as in later SDA disposal operations. Type A probe installations were positioned to coincide with strong anomalies observed in surface geophysics data. These anomalies were interpreted to show the position of buried drums.

Figure F-7 shows targeted drum disposal locations, surface geophysics (magnetic field data), and the location of the six Pit 2 Type A probes.

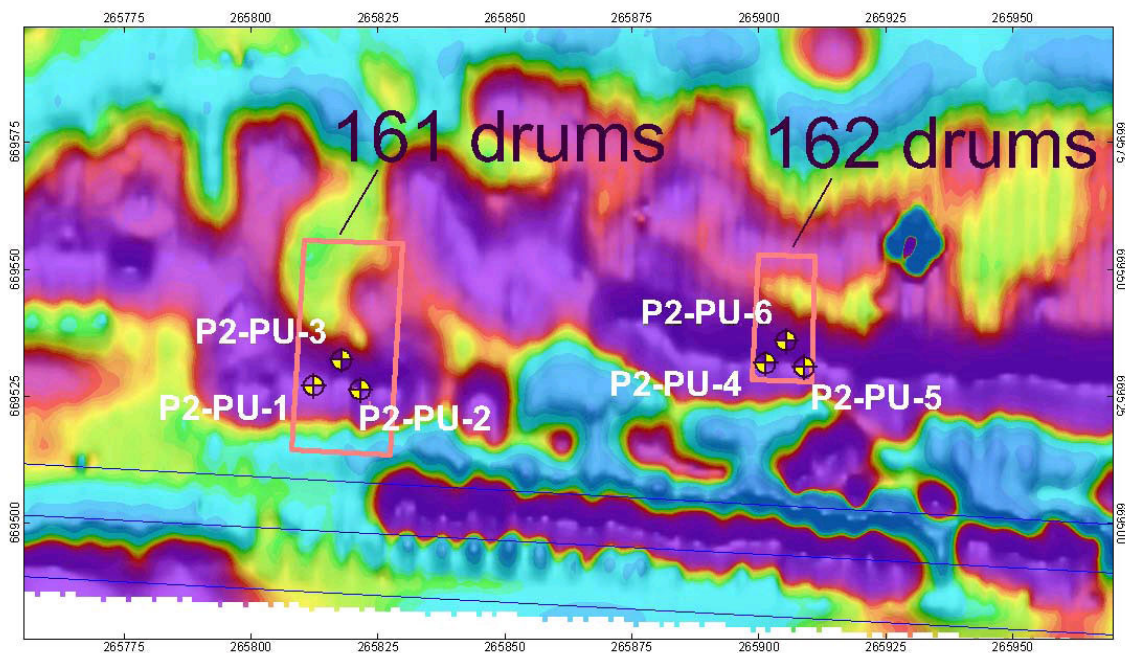


Figure F-7. Pit 2 High Pu Density Focus Area.

The six Type A probes, P2-PU-1–P2-PU-6, were installed during December 2003 as depicted in Figure F-7. The driller observed that the probes did not go in smoothly as others had in the past. Numerous stops and starts were experienced during probe installation, suggesting alternating harder and softer zones in the subsurface. The driller also indicated that a screeching sound of metal on metal could be heard during each probe installation.

Downhole logging was conducted in the Pit 2 probes during December 2003. The logging data show that the Pit 2 probes penetrated significant Pu/Am contamination zones. The measured Pu levels in

P2-PU-1 are among the highest observed anywhere in the SDA. Significant U-238 contamination was also observed in P2-PU-4.

To support further Pu characterization in this area, four lysimeters and two SMRs are planned for installation in Pit 2. The lysimeters will be called as follows:

- P2-PU-L1
- P2-PU-L2
- P2-PU-L3
- P2-PU-L4.

The SMR will be called as follows:

- P2-PU-M1
- P2-PU-M2.

Table F-10 summarizes all Type B probes proposed for installation in the new focus areas discussed in this and previous subsections.

Sampling Equipment and Procedures

Section 5 of the main body of this plan describes the sampling Equipment and Procedures used to support this investigation; however, in addition to the new areas of investigation, one significant change has been made to the sampling equipment as part of the 2003–2004 probing activities. The 2003–2004 Probing Project introduced a new lysimeter probe system referred to as the Type B+ lysimeter probe, used to collect samples in the Subsurface Disposal Area (SDA). The Type B+ probe system is the next generation design of the Type B lysimeter probe that was installed into the SDA in 2001, and described in the main body of this plan. The new B+ lysimeter probes will be used to collect water and possibly vapor samples from the soil and waste zones.

The Type B+ lysimeter design is very similar to that of its predecessor, the Type B lysimeter. The Type B+ probe system is actually a Type B probe, but is referred to as a “B+” probe so as to delineate its design from that of its 2001 Type B lysimeter predecessor. The B+ probe system incorporates the already proven technology (i.e., equipment and methodology) developed by the existing Type B lysimeter and incorporates additional functional probe improvements.

The B+ probe system installation varies from that of the 2001 B probe system installation methods. Unlike the Type B lysimeter probe, the B+ lysimeter is not part of the probe casing and is not driven into the ground with the probe casing. The B+ lysimeter is installed into the probe casing’s cavity after the casing is driven to its desired depth. Based on the field experience obtained from the 2001 Type B probes, the RadCon requirement has been altered to allow for probe casing and instrument separation.

The B+ probe system also provides some added equipment and checks for contamination barrier verification. A component integral to the contamination barrier is the addition of a small amount of water that is placed into the casing tip prior to the B+ probe string is advanced into the ground. The water acts as a secondary boundary that resides in the probe string’s filter tip, and is used to fill the small filter openings (i.e., 0.5 micron diameter) during probe string installation. The EDF-4292, “Type B+ Probe System Design,” describes the construction and design and specifications of the new probe. The Installation procedure for the probe is detailed in TPR-7357, “New Type B Probe Installation.”

Table F-9. Pit 2 high Pu density focus area target disposals.

DISPOSAL D	GENERATOR	TYPE	WASTE	STRE	CONTAINER	SHIPMENT W	CONTAINER	CONTENTS D	VOL	MAP KEY	SHIPMENT K	LOCATION
8/4/1961	776	Type V	RFO-DOW-9/10H		16	3078	55-gal drum(s)	(1) 18 (55-gal) drums of 74 series sludge, (2) 142 (55-gal) drums of paper, rags, scrap metal, etc. (3) 1 metal box of scrap metal. (Curies not feasible)	118	RFODOWSR108/02/61810	RFODOWSR108/02/61810	Barrel Rows #51 & 52
9/15/1961	776	Type V	RFO-DOW-9/10H		33	7259	55-gal drum(s)	(1) 1 (55-gal) drum of 74 series sludge, (2) 156 (55-gal) drums of paper, rags, scrap metal, etc. (3) 1 (40-gal) drum of filter paper, (4) 4 wooden boxes of scrap metal. (Curies not feasible)	243	RFODOWSR109/12/61810	RFODOWSR109/12/61810	Barrel Rows #58 & 59
9/22/1961	776	Type V	RFO-DOW-9/10H		44	9555	55-gal drum(s)	(1) 12 (55-gal) drums of 74 series sludge, (2) 125 (55-gal) drums of paper, rags, scrap metal, etc. (3) 13 wooden boxes of scrap metal. (Curies not feasible)	323	RFODOWSR109/20/61800	RFODOWSR109/20/61800	Barrel Rows #63 & 64
9/22/1961	776	Type V	RFO-DOW-9/10H		5	976	55-gal drum(s)	(1) 40 (55-gal) drums of 74 series sludge, (2) 120 (55-gal) drums of paper, rags, scrap metal, etc. (Curies not feasible)	37	RFODOWSR109/20/61810	RFODOWSR109/20/61810	Barrel Rows #61 & 62
	776	Type V	RFO-DOW-9/10H		22	4875	55-gal drum(s)	(1) 166 (55-gal) drums of paper, rags, scrap metal, etc., (2) 2 (30-gal) drums of paper, rags, scrap metal, etc. (3) 2 wooden boxes of scrap metal. (Curies not feasible)	162	RFODOWSR107/12/61810	RFODOWSR107/12/61810	Barrel Rows #47 & 48
	776	Type V	RFO-DOW-9/10H		42	9643	55-gal drum(s)	(1) 182 (55-gal) drums of paper, rags, scrap metal, etc. (Curies not feasible)	309	RFODOWSR106/28/61810	RFODOWSR106/28/61810	Barrel Rows #45, 46, & 47
10/13/1961	776	Type V	RFO-DOW-9/10H	Drums of interest	162	11284	55-gal drum(s)	(1) 183 (55-gal) drums of paper, rags, scrap metal, etc. (2) 1 (40-gal) drum of filter paper. (Curies not feasible)	368	RFODOWSR110/11/61800	RFODOWSR110/11/61800	Barrel Rows #71 & 72
10/20/1961	776	Type V	RFO-DOW-9/10H		1	140	55-gal drum(s)	(1) 43 (55-gal) drums of 74 series sludge, (2) 117 (55-gal) drums of paper, rags, scrap metal, etc. (3) 8 pasteboard boxes of CWS Type filters, (4) 1 wooden box of scrap metal. (Curies not feasible)	7	RFODOWSR110/18/61810	RFODOWSR110/18/61810	Begin at point 233° W 80° N from SE pit marker run 25° W & 30° N.
10/20/1961	776	Type V	RFO-DOW-9/10H		35	8347	55-gal drum(s)	(1) 184 (55-gal) drums of paper, rags, scrap metal, etc. (2) 4 wooden boxes of scrap metal. (Curies not feasible)	257	RFODOWSR110/18/61800	RFODOWSR110/18/61800	Barrel Rows #74 & 75
11/3/1961	776	Type V	RFO-DOW-9/10H		10	2130	55-gal drum(s)	(1) 30 (55-gal) drums of 74 series sludge, (2) 50 (55-gal) drums of paper, rags, scrap metal, etc. (3) 314 pasteboard boxes of CWS type filters. (Curies not feasible)	74	RFODOWSR110/31/61810	RFODOWSR110/31/61810	Barrel Rows #75 thru 80
11/10/1961	776	Type V	RFO-DOW-9/10H		16	3894	55-gal drum(s)	(1) 180 (55-gal) drums of paper, rags, scrap metal, etc. (2) 2 (30-gal) drums of filter paper, (3) 13 (15-gal) drums of paper, rags, scrap metal, etc. (4) 2 wooden boxes of scrap metal. (Curies not feasible)	118	RFODOWSR111/08/61800	RFODOWSR111/08/61800	Barrel Rows #84 thru 88
11/17/1961	776	Type V	RFO-DOW-9/10H		19	5236	55-gal drum(s)	(1) 162 (55-gal) drums of paper, rags, scrap metal, etc. (2) 2 (30-gal) drums of scrap metal. (Curies not feasible)	140	RFODOWSR111/15/61800	RFODOWSR111/15/61800	Barrel Rows #90 thru 93
12/1/1961	776	Type V	RFO-DOW-9/10H		16	3610	55-gal drum(s)	(1) 180 (55-gal) drums of paper, rags, scrap metal, etc. (2) 31 pasteboard boxes of CWS type filters. (Curies not feasible)	118	RFODOWSR111/29/61800	RFODOWSR111/29/61800	Barrel Rows #92 thru 95
12/15/1961	776	Type V	RFO-DOW-9/10H		14	2522	55-gal drum(s)	(1) 40 (55-gal) drums of 74 series sludge, (2) 120 (55-gal) drums of paper, rags, scrap metal, etc. (Curies not feasible)	103	RFODOWSR112/12/61800	RFODOWSR112/12/61800	Point 342° W & 20° N from SE pitmarker - run 25° N & 18° W.
				Drums of interest	161							

Table F-10. Summary of lysimeters and SMRs proposed for installation in new focus areas.

Focus Area	Probe Cluster	Justification	New SMR/Lysimeter Location	New SMR/ Lysimeters
Enriched Uranium Source Area 1a	EU Enriched Uranium	Based on logging data place one lysimeter in proximity of W23 and one lysimeter in proximity of T3-EU-2.	One lysimeter on south side of T3-EU-02 at 15 ft and one lysimeter on eastside of W23 to refusal about 22 ft	T3-EU-L1 T3-EU-L2
Irradiated Fuel Material Area 1b	IF Irradiated Fuel	2 additional probes placed based on azimuthal data, lysimeter locations will be selected based on new logging results	Waiting for logging results from two more Type As close to IF-1 and IF-2, T47-IF-5 and T47-IF6	T47-IF-L1 T47-IF-L2
Irradiated Fuel Material Area 1c	IF Irradiated Fuel	1 lysimeter will be placed adjacent to each of 2 deep lysimeter installations and one aborted location in the east end of the SDA to monitor the vadose zone above basalt	The deep lysimeter installations are RWMC-2004 and RWMC-2006. The aborted location is known as RMWC-2005.	T50-IF-L1 T48N-IF-L1 T48S-IFLL1
Liquid Waste Disposal Area 2	HAL High Activity Liquid	Based on logging results from HAL 2 place 2 lysimeters to monitor for cesium and cobalt and 2 SMRs to monitor moisture content	Place lysimeters on east and west sides of HAL2 aligned with the trench and place the SMRs on the north and south sides of HAL2, all at 21 ft, which should be close to refusal	HAL2-L1 HAL2-L2 HAL2-M1 HAL2-M2
Uranium/Enriched Uranium Pit 5 Area 3	UEU	Logging confirms large quantities of Pu-Am-Np and U waste, monitor close to TW-1, at two depths by P5-UEU-4 and in cluster Pit5-4 with lysimeters, monitor moisture content at P5-UEU-4 with SMRs at 2 depths	Lysimeters – 1 close to TW-1 at 12 ft, 1 duplicate in Pit5-4 at refusal about 16 ft, 1 NE and 1 SE of P5-UEU-4 at 14 ft and refusal about 17 ft. 2 SMRs west of P5-UEU-4 at 5 ft and 15 ft.	P5-TW1-L2 P5-4-L2 P5-UEU-L1 P5-UEU-L2 P5-UEU-M P5-UEU-MB
Pit 6 High Pu Density Area 5	P6-PU	Logging indicates high levels of Am at P6-PU-1, install lysimeters on east side of P6-PU-1 and monitor moisture content on west side	1 lysimeter at 15 ft on east side of P6-PU-1 and a second lysimeter 2 ft further east at refusal about 20 ft, 1 SMR probe on west side of PU-1 one SMR sensor at 5 ft and a second SMR sensor at 15 ft	P6-PU-L1 P6-PU-L2 P6-PU-M
Pit 2 High Pu Density Area 7	P2-PU	Logging results verify significant Pu quantities and probe installations indicate drummed stacked waste	1 lys. on P2 side of P1 at 11 ft, 1 lys. on P3 side of P1 at 15 ft, 1 lys. on P4 side of P6 at refusal, 1 lys. on P5 side of P6 at refusal ~ 15 ft. Install 2 SMRs to monitor moisture with and without the geomembrane	P2-PU-L1 P2-PU-L2 P2-PU-L3 P2-PU-L4 P2-PU-M1 P2-PU-M2